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Original Article

Curative effect of Tai Chi exercise in combination with auricular plaster therapy on improving obesity patient with secondary hyperlipidemia

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Abstract: Objective: Observe the effect of Tai Chi in combination with auricular plaster therapy on treating obesity patient with secondary hyperlipidemia. Method: Select 45 patients who suffer from simple obesity and secondary hyperlipidemia and then adopt random digital table to divide them into a Tai Chi group, an auricular plaster therapy group and a combination group. Each group consists of 15 patients. The patients in Tai Chi group are trained with Tai Chi twice a day, while those in auricular plaster therapy are treated with auricular plaster therapy 3-5 times a day and those in the combination group are trained with Tai Chi and auricular plaster therapy twice a day. BMI, body fat percentage and blood lipid indexes are respectively detected for the selected patients in the three groups before treatment and after 180 days' treatment. Results: After 180 days' treatment, BMI index and body fat percentage of Tai Chi group are significantly improved in comparison with those before treatment ($P<0.05$) and the blood lipid index also presents the improvement trend, but the overall effect is not obvious; body fat percentage and BMI index of the auricular plaster therapy group are not improved obviously in comparison with those before the treatment ($P>0.05$) but the blood lipid index is improved significantly ($P<0.05$); each index of the combination group is improved significantly compared with those before treatment ($P<0.05$). By comparing the improvement effect after treatment with that of the other two groups, $P<0.05$, the difference shows the statistical significance and the treatment effect is more obvious. Conclusion: As for the patient suffering from simple obesity and secondary hyperlipidemia, Tai Chi exercise in combination with auricular plaster therapy can show the obvious synergistic therapeutic effect and thus the combined curative effect is obviously superior to that of the single therapy method.

Keywords: Tai chi, auricular plaster, combination, obesity, hyperlipidemia, curative effect

Introduction

In the current clinical situation, hyperlipidemia patient is common. It includes high cholesterol, hypertriglyceridemia and compound-type hyperlipidemia. The disease refers to high blood lipid level induced by the body lipid metabolism disorder. Meanwhile, the high blood lipid is one of the main factors in inducing atherosclerosis and coronary heart disease (CHD) and it seriously threatens the patient's physical and mental health [1, 2]. Hyperlipidemia can be divided into primary and secondary hyperlipidemia, among which the primary hyperlipidemia is related to congenital and genetic factors and the secondary hyperlipidemia is induced by the metabolic disorder disease, for example, obesity, living habits and age are the main inducements [3, 4]. As for the treatment method of the patient suffering from obesity and secondary hyperlipidemia, in addition to the common drugs, the curative effect of rehabilitation training and traditional Chinese medicine acupoint stimulation therapy is widely recognized. Tai Chi is an aerobic fitness exercise and it is suitable for the elderly patients to exercise; auricular plaster is one of the auricular point therapies and it is a new therapy developed in recent years on the basis of the ear acupuncture therapy. It is characterized by easy understanding, easy promotion, reliable curative effect, affordable and less side effects [5, 6], while it can be used as a daily adjuvant therapy means by the elderly patients. Therefore, the obesity and secondary hyperlipidemia patient is taken as the study subject in this

study and it conducts the practical study for the patients by the combination treatment of Tai Chi and auricular plaster and then it can investigate the effect of the combined therapy. After 180 days' treatment, it is found that the effect of the combination therapy is significant. The report is as follows.

Materials and methods

Study object

From Oct. 2013 to July 2014, the first-hand data of the patients were obtained from the school affiliated hospital and then 45 patients were selected from those who meet the eligible conditions for practical treatment by referring to classification standards of the over-weight and obesity patients provided by Data Summarization Analysis Coordination Group, China Obesity Problem Working Group and hyperlipidemia disease diagnosis standard in the seventh edition-Internal Medicine, the national planning textbook of China ordinary higher education during the Eleventh Five-Year plan period. See **Figure 1**.

The selected patients are divided in by a Tai Chi group, an auricular plaster therapy group and a combination group. Each group consists of 15 patients. Upon the statistics comparison of the basic data for the three groups of patients before the treatment, it is found that their difference shows no statistical significance ($P > 0.05$) and it is comparable. See **Table 1**.

Treatment method

Tai Chi exercise group: Chen Style Tai Chi Health Maintenance textbook and the disc attached to the textbook are used as a guide. First, under the guidance of professionals, the patients are trained Tai Chi for 60 min twice a day and such exercise lasts for about 1 week until the patients can finish the training independently by hearing the background music and voice instructions. The patients are trained for 45 min twice a day (Morning and evening). The intensity of training maintains mild level, namely, the patients keep 100/min heart rate in the exercise process and they are trained for 180 d.

Auricular plaster therapy group: In the ear, select heart, lung, liver, spleen, kidney, Sanjiao, small intestine, large intestine, gallbladder and stomach acupoints as well as the corresponding sensitive points of the important acupoints that is conductive to regulate transportation and transformation of the human body and metabolic imbalance.

Use a medicine tape attached with Vaccaria seeds on the selected points and the Vaccaria seeds stick to the selected ear acupoints. Only an ear auricle is posted each time and the patients can press the Vaccaria seeds on the ear plaster. The force exercised on the ear plaster can be increased little by little and is limited to that the patients can bear and numbness and burning sensation occurs. Press the ear plaster in cycle. Each acupuncture point is pressed for 3-5 times and each times lasts for 5-10 min. Switch to another acupuncture point after consecutively pressing it for 15 min in cycle. Two ears are posted alternatively at the interval of 3 days. A total of 180 days' pressing treatment is required.

Combination group: They are trained with Tai Chi exercise, on this basis, the auricular plaster is provided for them for the purpose of the combined therapy. The combined therapy method: in each time, after 40 min Tai Chi exercise, they are treated with auricular plaster massage for 5-10 min and then a auricular plaster massage is provided respectively at noon break and before the sleep in the evening. Total days for the combined treatment are 180 d.

Index detection

① At the time of selection and after 180 days' treatment, adopt JS7-G65 type body composition analyzer produced by Beijing Zhongxi Yuanda Science and Technology Co., Ltd. to detect the patients' weight, body fat and other indexes, among which BMI index = weight (kg)/height (m^2).

② At the time of selection and after 180 days' treatment, adopt the immunoturbidimetry method to detect the content of apoB100 and apoAI.

③ At the time of selection and after 180 days' treatment, take the venous blood to detect the blood lipid index of the patient. The methods for taking blood and detection are as follows: (1) The patients shall not eat high fat diet in supper before the day in which the blood is taken; in the morning in which the blood is

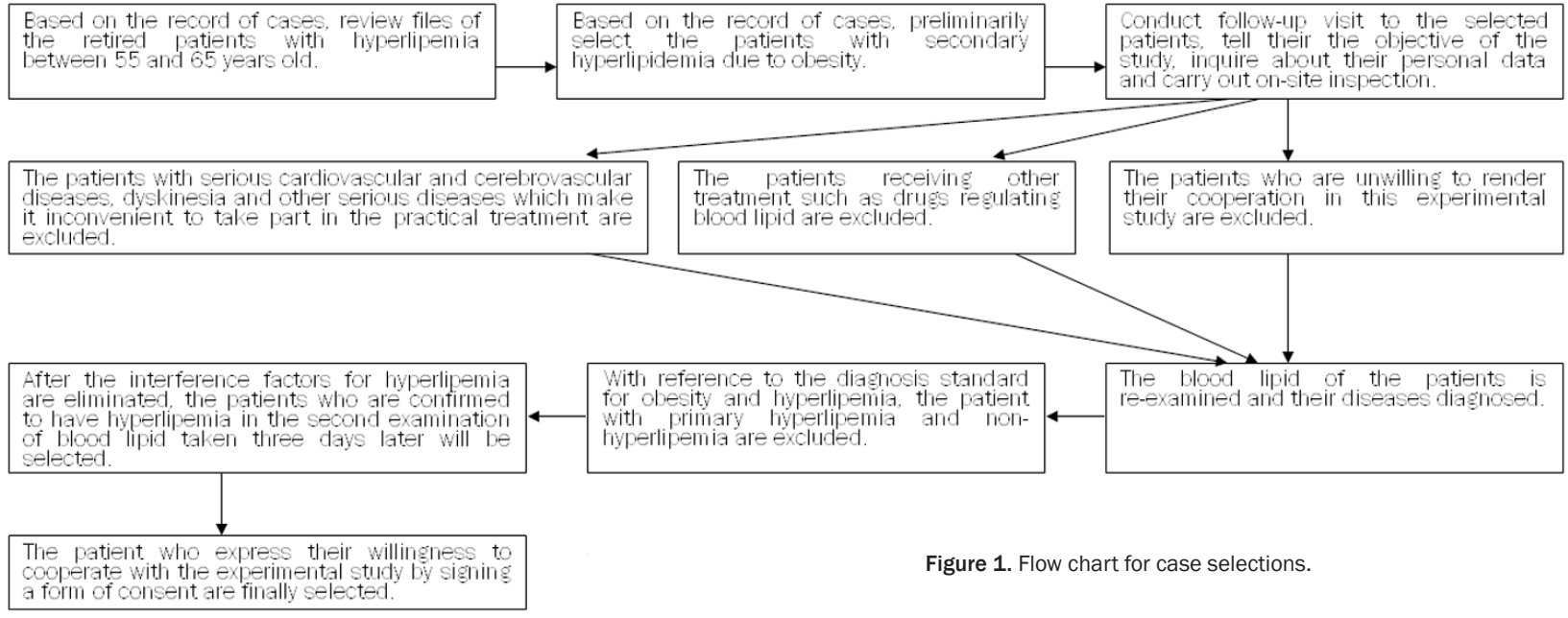

Figure 1. Flow chart for case selections.

Table 1. Comparison of general information for 3 groups of the patients before treatment ($\overline{x}\pm s$)

Group	Male/female (case)	Age	Height (cm)	Body weight (kg)	BMI index (kg/m^2)	Body fat percentage (%)	High TC (case)	High TG (case)	Compound type (case)
Tai Chi group	9/6	59.6±4.72	166.1±4.09	81.6±6.49	29.6±3.27	31.5±2.84	4	3	8
Auricular plaster therapy group	9/6	60.5±4.61	166.3±4.22	81.2±5.80	29.4±3.45	31.2±2.40	5	4	6
Combination group	8/7	60.3±4.50	165.4±4.31	80.4±6.07	29.4±3.59	31.3±2.59	4	4	7

Note: P>0.05.

Table 2. Comparison of obesity index for 3 groups of the patients before and after treatment ($\overline{x}\pm s$)

Group	Male/female (case)	BMI index (kg/m^2)		Body fat percentage (%)	
		Before treatment	After treatment	Before treatment	After treatment
Tai Chi group	9/6	29.6±3.27	27.5±3.14[a]	31.5±2.84	29.2±2.77[a]
Auricular plaster therapy group	9/6	29.4±3.45	29.1±3.46	31.2±2.40	30.9±2.41
Combination group	8/7	29.4±3.59	26.8±3.09[a]	31.3±2.59	27.5±2.35[a,b,c]

Note: comparing with that before treatment, [a]P<0.05; after the patients in the combination group are treated, comparing with the Tai Chi Group at the same time points, [b]P<0.05. After the patients in the combination group are treated, comparing with the auricular plaster therapy group at the same time points, [c]P<0.05.

Table 3. Comparison of blood lipid for 3 groups of patients before and after the treatment

Index	Tai Chi group (n=15)		Auricular plaster therapy group (n=15)		Combination group (n=15)	
	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
TC (mmol/L)	6.92±0.51	6.31±0.44[a]	6.92±0.49	6.30±0.42[a]	6.88±0.49	6.01±0.40[a,b]
TG (mmol/L)	2.37±0.29	2.09±0.25[a]	2.35±0.29	2.1±0.24[a]	2.40±0.31	1.86±0.26[a,b,c]
LDL-C (mmol/L)	3.57±0.32	3.20±0.30[a]	3.57±0.33	3.23±0.31[a]	3.59±0.35	2.83±0.33[a,b,c]
HDL-C (mmol/L)	1.03±0.22	1.05±0.18	1.02±0.20	1.26±0.21[a]	1.02±0.19	1.47±0.22[a,b,c]
apoB100 (g/L)	0.95±0.18	0.93±0.17	0.96±0.19	0.90±0.18[a]	0.95±0.20	0.86±0.17[a,b]
apoAI (g/L)	1.17±0.20	1.19±0.23	1.18±0.21	1.24±0.22[a]	1.16±0.22	1.30±0.24[a,b,c]

Note: Comparing with that before treatment, [a]P<0.05; after the patients in the combination group are treated, comparing with the Tai Chi Group at the same time points, [b]P<0.05. After the patients in the combination group are treated, comparing with the auricular plaster therapy group at the same time points, [c]P<0.05.

taken, the patients shall not eat any food for the purpose of taking blood; (2) After 180 days' treatment, stop relevant treatment for two groups of patients and then take blood at the 182nd day; (3) Use Japanese Olympus Au 400 type automatic biochemical analyzer to detect the patient's serum total cholesterol (TC), triglyceride (TG), low density lipoprotein cholesterol (LDL-C), high density lipid protein cholesterol (HDL-C) and blood lipid indexes.

Statistical processing

Use SPSS 13.0 version software to process and data, while the obtained data is expressed by ($\overline{x}\pm s$). Then compare the internal group data before and after the treatment and compare the effect of the inter-group after the treatment. Multiple groups are analyzed by the variance. If the total difference shows the statistical significance, dunnett-t test is used to conduct pairwise comparison. Use *t* test to compare the effect within the group before and after treatment; meanwhile, use X^2 test to compare the count data; in case of P<0.05, the difference has the statistical significance.

Results

It can be seen from **Table 1** that upon the statistics consistence comparison of the general information for the three groups of the selected patients before treatment, P>0.05, the difference shows no statistical significance and it is comparable. After 180 days' treatment, it can be known from **Tables 2** and **3**: ① After the treatment, both BMI index and body fat rate of the patients in the Tai Chi group and the combination group are improved significantly compared with those before the treatment, [a]P<0.05; both BMI index and body fat rate of the patients in the auricular plaster therapy group are not improved significantly compared with those before the treatment. ② After the treatment, the blood lipid index of the combination group and the auricular plaster therapy group is improved significantly compared with those before the treatment, [a]P<0.05; in the Tai Chi group, other indexes are not improved significantly except that TC, TG and LDL-C are improved significantly compared with those before the treatment. ③ After the treatment, comparing the Tai Chi group with the combination group or the auricular plaster therapy group at the same time points, [b]P<0.05 or [c]P<0.05, the curative effect of the combination group is more obvious.

Discussion

Obesity is an inducement of many cardiovascular and cerebrovascular diseases, among which

high blood lipids, hypertension and hyperglycemia are commonly known as the "three-high" disease. It seriously threatens the patient's physical and mental health and even may develop into a lethal cause [7, 8]. In recent years, with the improvement of material living standards, because of many factors such as the movement inertia and irregular life habits, the incidence of obesity in our country presents a substantial upward trend. Therefore, the patients, who are obesity and secondary hyperlipidemia, can be described as that their food is delicious but their exercise is insufficient, as a result, their blood lipid rises. At present, many theories and practice studies are reported about losing weight and reducing blood lipid by aerobic exercise and its curative effect is also widely recognized by both doctors and patients. Schjerve IE etc [9] after 42 patients are trained with aerobic endurance exercise for 45 min once a day in the total of 6 consecutive weeks, it is found that both body fat and blood fat index have been generally improved; However, Lau PW etc [10] pointed out in research reports that the exercise load for the obese people, especially secondary hyperlipidemia patients, shall be proper. The trainer can't bear the excessive load training and thus it has to reduce the training intensity. The excessive load training doesn't facilitate the body fat metabolism. In order to obtain obvious curative effect for improving the body fat and blood lipid, the training volume shall be increased significantly under the less training load and intensity. That is to say, it is no doubt that both body weight and fat can be lost by the aerobic training, but the training load shall be properly arranged depending on the body endurance of the patient, in other words, the training volume shall be matched with the training intensity, in this way, it is more conducive to obtain apparent effect. And elderly obesity and secondary hyperlipidemia patients belong to a special group. First, the body constitution of the elderly people declines significantly, thus they are not suitable for the high-intensity training, especially the selected patients in the study show fat body and high blood lipid. They are not suitable for high intensity training, even they are hard to bear the low intensity and load training. Taking the selected patients in the study into consideration, it is necessary to select the proper aerobic training program.

Tai Chi is an aerobic exercise and its movement is slow. In the process of practicing, it shows quiet movement in the posture and the fast and slow movements are combined, which is conducive to the regulation of practitioners' physical and mental conditions and it is suitable for the elderly people to practice [11, 12]. Therefore, 18 patients in this study are trained with Tai Chi (aerobic training means) for 180 d and then it is found that the body fat percentage and body mass index (BMI) are significantly improved in comparison with those before treatment, $^{a}P<0.05$; The blood lipid index also is improved in general trend, but the overall index is not improved obviously, which may be related to the insufficient training load and short training cycle.

It is confirmed in the modern medicine that ear is a holographic epitome of body tissues and organs. It is recognized that twelve meridians are connected with the ear and it can clear the meridians, regulate the body mechanism and promote rehabilitation of the lesion site through electroacupuncture stimulation on the ear, plaster and catgut implantation at acupuncture point [13-15]. After Wu B etc [16] treats 30 obese patients by the combination treatment means of acupuncture and auricular plaster, it is found that their obesity index is significantly improved; Darbandi M etc [17] points out that abnormal blood lipid is closely related to the important internal organs, which are responsible for transportation and transformation and metabolism of human body, such as liver, gallbladder, spleen, stomach, large intestine and small intestine. It indicates that the imbalance transportation and transformation and metabolism of human body are the center links for early lipid abnormality. Also it is confirmed that after the abnormal blood lipid patients are treated by auricular plaster therapy for 3 months, their blood lipid is significantly improved; Additionally, Zhang FH etc [18] that catgut implantation at acupuncture point in combination with auricular plaster can significantly improve the body fat, blood lipid and glycemic indexes for the simple obesity patients. In this study, after 18 patients in the auricular plaster therapy group are treated by the auricular plaster for 180 days, although BMI index and the body fat percentage are not improved significantly, the blood lipid index is improved significantly, $^{a}P<0.05$. It is confirmed that after 180 days' auricular plaster therapy, it indeed

improves the blood lipid index of the patients suffer from obesity and secondary hyperlipidemia.

Based on the aerobic exercise, auricular plaster therapy theory and the relevant clinical reports, the patients, suffering from obesity and secondary hyperlipidemia, are intervened by Tai Chi exercise and auricular plaster therapy in this study. The selected ear acupoints, based on the human body acupuncture point theory, respectively correspond to heart, lung, liver, spleen, kidney, Sanjiao, small intestine and large intestine, gallbladder and stomach acupoints. It intends to clear the meridians, help metabolism, transportation and transformation of human body and promote regulation of the body metabolism imbalance so as to improve dyslipidemia. The study results show that the patients of the combination group are treated by the above combined treatment, their BMI, body fat rate and blood lipid indexes are significantly improved compared with those before treatment ($^{a}P<0.05$) and the improvement effect is obviously superior to that of the single Tai Chi training group or auricular plaster therapy group ($^{b}P<0.05$ *or* $^{c}P<0.05$). This study demonstrates that the curative effect of the combination group is better than the single Tai Chi training group or auricular plaster therapy group.

In summary, it is suitable for elderly patients to adopt Tai Chi training means as the aerobic training, which matches with their physical and psychological characteristics in respect of the training load but also be conducive to the regulation of the elderly people's physical and mental state and improve the function of human body and blood lipid indexes; meanwhile, it can regulate the metabolic function of the human body by auricular plaster therapy means on the corresponding meridian acupoints. The therapy is simple and easy, thus the elderly people can use it as a daily exercise except an auxiliary means of Tai Chi. The results indicate that the curative effect of the combination therapy is significantly better than that of single treatment and the combination therapy is simple and feasible and it was suitable for implementation and promotion among the patients.

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Disclosure of conflict of interest

None.

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